

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 Claim 1 (previously presented): A multi-tone signal
2 communications method for communicating information using
3 N tones, where N is a positive integer greater than one,
4 the method comprising:
5 generating N analog signals, each one of the N
6 analog signals corresponding to a different one of the N
7 tones, wherein each of the N analog signals includes a
8 periodic signal representing a symbol to be transmitted
9 during said symbol transmission period;
10 separately generating N signal prefixes, one
11 signal prefix being generated for each one of the N
12 analog signals from the one of the N periodic signals
13 included in the corresponding one of the N analog
14 signals, each of the N signal prefixes including multiple
15 parts and wherein the step of separately generating N
16 signal prefixes includes, for each one of the N analog
17 signals:
18 i) generating a first cyclic prefix part from the
19 included periodic signal representing the current symbol;
20 and
21 ii) generating a second prefix part from the
22 included periodic signal representing the preceding
23 symbol and from the first cyclic prefix part; and
24 transmitting the N analog signals into a
25 communications channel using M antennas, where M is an
26 integer and where $1 < M < N$.

1 Claim 2 (original): The method of claim 1, wherein $M=N$.

1 Claim 3 (original): The method of claim 1, further
2 comprising the step of:
3 separately amplifying each of the N analog
4 signals prior to transmitting said N analog signals.

1 Claim 4 (previously presented): The method of claim 3,
2 wherein each of said N analog signals has a duration
3 corresponding to at least a symbol transmission period.

1 Claim 5 (original): The method of claim 4, wherein the N
2 periodic signals and signal prefixes are generated in the
3 passband.

1 Claim 6 (previously presented): The method of claim 4,
2 wherein each of the N analog signals has a duration
3 corresponding to multiple symbol transmission periods.

1 Claim 7 (canceled)

1 Claim 8 (previously presented): The method of claim 1,
2 wherein the step of generating a second prefix part
3 includes cyclically extending the periodic signal
4 representing the included preceding symbol and cyclically
5 extending the first cyclic prefix part to correspond to
6 the same time period; and
7 combining and attenuating the cyclically
8 extended portion of the first cyclic prefix part and the
9 cyclically extended portion to the included periodic
10 signal representing the preceding symbol.

1 Claim 9 (previously presented): A multi-tone signal
2 communications method for communicating information using
3 N tones, where N is a positive integer greater than one,
4 the method comprising:
5 generating N analog signals, each one of the N
6 analog signals corresponding to a different one of the N
7 tones and wherein each of said N analog signals has a
8 duration corresponding to at least a symbol transmission
9 period and wherein each of the N analog signals includes
10 a periodic signal representing a symbol to be transmitted
11 during said symbol transmission period;
12 separately generating N signal prefixes, one
13 signal prefix being generated for each one of the N
14 analog signals from the one of the N periodic signals
15 included in the corresponding one of the N analog
16 signals;
17 separately amplifying each of the N analog
18 signals prior to transmitting said N analog signals; and
19 transmitting the N analog signals into a
20 communications channel using M antennas, where M is an
21 integer and where $1 < M \leq N$,
22 wherein each of the N signal prefixes includes
23 multiple parts and wherein the step of separately
24 generating N signal prefixes includes, for each one of
25 the N analog signals:
26 generating a first cyclic prefix part from the
27 included periodic signal representing the current symbol;
28 and
29 generating a second prefix part to be a
30 periodic signal, the beginning of the generated second

31 prefix part having the same phase as the end of the
32 periodic signal representing the preceding symbol and the
33 end of the generated second prefix part having the same
34 phase as the beginning of the first cyclic prefix part.

1 Claim 10 (original): The method of claim 6, wherein each
2 of the N periodic signals is a sinusoidal wave.

1 Claim 11 (original): The method of claim 6, wherein each
2 of the N periodic signals is a square wave.

1 Claim 12 (previously presented): A multi-tone signal
2 communications method for communicating information using
3 N tones, where N is a positive integer greater than one,
4 the method comprising:
5 generating in parallel, for each one of the N
6 tones, a separate periodic signal including at least one
7 high order harmonic signal component that is different
8 from the fundamental frequency signal component of said
9 tone, wherein the generated periodic signal includes a
10 square wave; and
11 transmitting the generated N periodic signals
12 into a communications channel.

1 Claim 13 (original): The method of claim 12, wherein the
2 periodic signal generated for each of the N tones,
3 includes multiple high order harmonic signal components.

1 Claim 14 (canceled)

1 Claim 15 (original): The method of claim 12, further
2 comprising:
3 generating, in parallel, for each one of the N
4 tones, a separate periodic signal prefix.

1 Claim 16 (original): The method of claim 15, wherein the
2 step of generating a separate periodic signal prefix for
3 each one of the N tones includes, for each one of the N
4 generated prefixes:
5 generating a cyclic prefix portion; and
6 generating a continuity signal portion, the
7 continuity signal portion being generated as a function
8 of a previously generated periodic signal and the current
9 generated periodic signal.

1 Claim 17 (original): The method of claim 15, further
2 comprising, for each one of the N tones, combining in the
3 passband, the periodic signal corresponding to the one of
4 the N tones with the corresponding one of the N periodic
5 signal prefixes.

1 Claim 18 (previously presented): A multi-tone signal
2 communications method for communicating information using
3 at least N tones, where N is a positive integer greater
4 than one, the method comprising:
5 separately generating, for each one of the N
6 tones, a passband periodic signal representing a symbol,
7 at least some of the N generated passband periodic
8 signals include a high order harmonic signal component in
9 addition to a fundamental frequency signal component, the

10 high order harmonic signal component having a frequency
11 which is higher than the frequency of the fundamental
12 signal component; and
13 transmitting the N generated passband periodic
14 signals.

1 Claim 19 (original): The method of claim 18, wherein the
2 passband periodic signals for each one of the N tones are
3 generated in parallel; and
4 wherein the step of transmitting the N
5 generated passband periodic signals includes broadcasting
6 different ones of said N passband periodic signals using
7 different antennas.

1 Claim 20 (currently amended): The method of claim 18,
2 further comprising:
3 combining at least some of the N generated
4 passband periodic signals prior to transmission.

1 Claim 21 (canceled)

1 Claim 22 (previously presented): The method of claim 18,
2 wherein each of the N generated periodic signals is a
3 square wave.

1 Claim 23 (original): The method of claim 18, further
2 comprising:
3 generating, a separate prefix for each of the N
4 generated passband periodic signals; and

5 combining, prior to transmission, each one of
6 the separate prefixes with the corresponding one of the N
7 generated passband periodic signals.

1 Claim 24 (original): The method of claim 23, wherein the
2 prefixes for each of the N passband periodic signals are
3 generated in parallel.

1 Claim 25 (original): The method of claim 23, wherein the
2 step of combining each one of the separate prefixes with
3 the corresponding one of the N generated passband
4 periodic signals includes:

5 prepending the generated prefix to the
6 corresponding one of the N generated passband periodic
7 signals.

1 Claim 26 (original): The method of claim 23, wherein
2 generating a separate prefix for each of the N generated
3 passband periodic signals includes, for each separate
4 prefix:

5 generating a first cyclic prefix part; and
6 generating a second prefix part, the second prefix
7 part being generated using a different generation
8 technique than the first prefix part.

1 Claim 27 (canceled):

1 Claim 28 (currently amended): A periodic signal
2 processing method, the method comprising:

3 generating a multi-part prefix from a first
4 periodic signal, the step of generating a multi-part
5 prefix from the first periodic signal including:
6 performing a cyclic extension operation on
7 the first periodic signal to generate a cyclic
8 prefix portion;
9 processing the cyclic prefix portion to
10 generate a continuity prefix portion from the
11 cyclic prefix portion; and
12 appending the cyclic prefix portion
13 to the end of the continuity prefix portion;
14 and
15 communicating a signal including the generated
16 multi-part prefix to a transmitter.

1 Claim 29 (currently amended): A periodic signal
2 processing method, the method comprising:
3 generating a multi-part prefix from a
4 first periodic signal, the step of generating a
5 multi-part prefix from the first periodic
6 signal including:
7 performing a cyclic extension
8 operation on the first periodic signal to
9 generate a cyclic prefix portion;
10 processing a preceding periodic
11 signal to generate a continuity prefix portion
12 from the preceding periodic signal; and

13 appending the cyclic prefix portion
14 to the end of the continuity prefix portion;
15 and
16 communicating a signal including the generated
17 multi-part prefix to a transmitter.

1 Claim 30 (currently amended): A periodic signal
2 processing method, the method comprising:
3 generating a multi-part prefix from a first
4 periodic signal, the step of generating a multi-part
5 prefix from the first periodic signal including:
6 performing a cyclic extension
7 operation on the first periodic signal to
8 generate a cyclic prefix portion;
9 processing the cyclic prefix portion and a
10 preceding periodic signal to generate a
11 continuity prefix portion from both the cyclic
12 prefix portion and the preceding periodic
13 signal; and
14 appending the cyclic prefix portion to the
15 end of the continuity prefix portion; and
16 communicating a signal including the
17 generated multi-part prefix to a transmitter.

1 Claim 31 (original): The method of claim 30, wherein
2 said processing of the cyclic prefix portion and a
3 preceding periodic signal includes:
4 performing a cyclic extension operation on the
5 cyclic prefix portion to generate a first cyclic
6 extension;

7 performing another cyclic extension operation
8 on the preceding periodic signal to generate a second
9 cyclic extension, the first and second cyclic extensions
10 corresponding to a signal time period which is the same
11 for both the first and second cyclic extensions; and
12 combining the first and second cyclic
13 extensions corresponding to said signal time period to
14 generate said continuity prefix portion, the step of
15 combining the first and second cyclic extensions
16 including:
17 windowing the combined cyclic extensions
18 using an attenuating window.

1 Claim 32 (original): The method of claim 31, wherein
2 each of said cyclic extension operations includes copying
3 a portion of the signal upon which said cyclic extension
4 operation is performed.

1 Claim 33 (currently amended): A periodic signal
2 processing method, the method comprising:
3 generating a multi-part prefix from a first
4 periodic signal, the step of generating a multi-part
5 prefix from the first periodic signal including:
6 performing a cyclic extension
7 operation on the first periodic signal to
8 generate a cyclic prefix portion;
9 generating a continuity prefix
10 portion;

11 appending the cyclic prefix portion
12 to the end of the continuity prefix portion;
13 and
14 wherein the continuity prefix portion has a
15 frequency which is different from the frequency of the
16 first periodic signal but has a phase at the point where
17 the cyclic prefix portion is appended to the continuity
18 prefix portion that is the same as the phase of the
19 beginning of the cyclic prefix portion; and
20 communicating a signal including the generated
21 multi-part prefix to a transmitter.

1 Claim 34 (currently amended): A periodic signal
2 processing method, the method comprising:
3 generating a multi-part prefix from a first
4 periodic signal, the step of generating a multi-part
5 prefix from the first periodic signal including:
6 performing a cyclic extension
7 operation on the first periodic signal to
8 generate a cyclic prefix portion;
9 generating a continuity prefix
10 portion;
11 appending the cyclic prefix portion
12 to the end of the continuity prefix portion;
13 and
14 wherein the continuity prefix portion has a
15 phase at the beginning of the continuity prefix portion
16 that is the same as the phase of the end of a preceding
17 periodic signal; and

18 communicating a signal including the generated
19 multi-part prefix to a transmitter.

1 Claim 35 (currently amended): A periodic signal
2 processing method, the method comprising:

3 generating a multi-part prefix from a first
4 periodic signal, the step of generating a multi-part
5 prefix from the first periodic signal including:

6 performing a cyclic extension
7 operation on the first periodic signal to
8 generate a cyclic prefix portion;

9 generating a continuity prefix
10 portion;

11 appending the cyclic prefix portion
12 to the end of the continuity prefix portion;
13 and

14 wherein the first periodic signal is one of N
15 period signals corresponding to N different tones of a
16 multi-tone signal, where N is a positive integer greater
17 than one, the method further including:

18 generating for each of the N periodic signals,
19 other than the first periodic signal, a separate multi-
20 part prefix from a corresponding one of the N periodic
21 signals, thereby generating N-1 multi-part signal
22 prefixes in addition to the multi-part prefix generated
23 from the first periodic signal; and

24 communicating a signal including the generated
25 multi-part prefix to a transmitter.

1 Claim 36 (original): The method of claim 35, further
2 comprising:
3 prepending each of the generated N-1 multi-part
4 prefixes and the generated multi-part prefix generated
5 from the first periodic signal to the corresponding ones
6 of the N periodic signals from which the multi-part
7 prefixes were generated.

1 Claim 37 (currently amended): ~~The method of claim 36,~~
2 ~~further comprising the step of:~~
3 A periodic signal processing method, the method
4 comprising:
5 generating a multi-part prefix from a first
6 periodic signal, the step of generating a multi-part
7 prefix from the first periodic signal including:
8 performing a cyclic extension
9 operation on the first periodic signal to
10 generate a cyclic prefix portion;
11 generating a continuity prefix
12 portion;
13 appending the cyclic prefix portion
14 to the end of the continuity prefix portion;
15 and
16 wherein the first periodic signal is one of N
17 period signals corresponding to N different tones of a
18 multi-tone signal, where N is a positive integer greater
19 than one, the method further including:
20 generating for each of the N periodic signals,
21 other than the first periodic signal, a separate multi-
22 part prefix from a corresponding one of the N periodic

23 signals, thereby generating N-1 multi-part signal
24 prefixes in addition to the multi-part prefix generated
25 from the first periodic signal;
26 prepending each of the generated N-1 multi-part
27 prefixes and the generated multi-part prefix generated
28 from the first periodic signal to the corresponding ones
29 of the N periodic signals from which the multi-part
30 prefixes were generated;
31 filtering each of the N periodic signals with
32 prepended multi-part prefixes in parallel; and
33 transmitting the filtered N periodic signals
34 with prepended multi-part prefixes into a communications
35 channel.

1 Claim 38 (original): The method of claim 37, wherein the
2 step of transmitting the filtered N periodic signals with
3 prepended multi-part prefixes includes broadcasting
4 different ones of the N periodic signals using different
5 antennas.

1 Claim 39 (original): The method of claim 38, further
2 comprising:
3 allowing the N broadcast periodic signals to
4 combine in the communications channel to form an N tone
5 OFDM signal.

1 Claim 40 (canceled)

1 Claim 41 (previously presented): A method of
2 sequentially transmitting symbols in a multi-tone signal

3 communication system using N tones per symbol period,
4 wherein the N tones remain the same for multiple symbol
5 periods, the time period in which the N tones remain the
6 same being a dwell, the method comprising:
7 for each symbol transmission period of the
8 dwell:
9 rotating a constellation of symbols from
10 which consecutive symbols are transmitted using
11 one of said N tones by a fixed amount and which
12 is a function of the duration of a multi-part
13 prefix to be transmitted and with the selected
14 symbol, wherein said fixed amount by which the
15 constellation of symbols is rotated is a
16 function of the tone frequency used;
17 selecting a symbol to be transmitted from
18 a constellation of symbols to be transmitted
19 using a signal corresponding to one of said N
20 tones; and
21 transmitting N signals corresponding to
22 each one of the N tones of the multi-tone
23 signal, each one of the N signals being
24 transmitted on a corresponding one of a first
25 plurality of antennas, the antenna being used
26 to transmit signals corresponding to a
27 particular tone during the dwell remaining the
28 same throughout the dwell.

1 Claim 42 (original): The method of claim 41, further
2 comprising the step of:

3 for each symbol transmission period of a second
4 dwell:
5 transmitting N signals corresponding to each one of
6 the N tones of the multi-tone signal, each one of the N
7 signals being transmitted on a corresponding one of a
8 second plurality of antennas, the antenna being used to
9 transmit signals corresponding to a particular tone
10 during the second dwell remaining the same throughout the
11 second dwell, the second plurality of antennas including
12 at least one antenna which is different from the antennas
13 included the first plurality of antennas.

1 Claim 43 (canceled)

1 Claim 44 (previously presented): The method of claim 41,
2 wherein the rotation of the constellation during each of
3 the plurality of symbol transmission period has a
4 cumulative rotational effect on the constellation from
5 which symbols are selected causing the rotation of the
6 symbols in one symbol transmission period to effect the
7 constellation from which symbols are selected during the
8 next symbol transmission period.

1 Claim 45 (previously presented): The method of claim 41,
2 wherein the rotation of the constellation during each of
3 the plurality of symbol transmission periods is by a
4 fixed additive amount which does not effect the position
5 of the symbols in the constellation from which the next
6 symbol is selected.

1 Claims 46-50 (canceled)

1 Claim 51 (previously presented): A system for generating
2 and transmitting signals corresponding to an N tone
3 multi-tone signal, where N is a positive integer greater
4 than 1, the system comprising:

5 N periodic signal generator circuits for
6 generating periodic signals, each periodic signal
7 corresponding to a different tone one of the N tones of
8 the multi-tone signal, wherein each of the N periodic
9 signal generator circuits includes a square wave
10 generator, each one of said N periodic signals including
11 a square wave having a frequency component corresponding
12 to one of said N tones of the multi-tone signal; and

13 N prefix generator circuits for independently
14 generating periodic signal prefixes, each one of the N
15 prefix generator circuits being coupled to a different
16 corresponding one of the N periodic generator circuits.

1 Claim 52 (original): The system of claim 51, further
2 comprising:

3 N filters for independently filtering the N
4 periodic signals including prefixes generated by the N
5 prefix generator circuits, each one of the N filters
6 being coupled to a different corresponding one of the N
7 prefix generator circuits.

1 Claim 53 (original): The system of claim 52, further
2 comprising:

3 a plurality of M antennas, where M is an
4 integer and where $1 < M < N$, each of the N filters being
5 coupled to a single one of the M antennas and each one of
6 the M antennas being coupled to at least one of the N
7 filters.

1 Claim 54 (original): The system of claim 53, wherein $M =$
2 N.

1 Claim 55 (original): The system of claim 54, wherein $M <$
2 N, the system further comprising, at least one analog
3 combining circuit for combining signals from a subset of
4 said N filters into a signal filter and for coupling each
5 filter in the subset of said N filters one of said M
6 antennas.

1 Claim 56 (canceled)

1 Claim 57 (original): The system of claim 51, wherein
2 each of the N prefix generator circuits generates a
3 separate prefix, each one of the N separate prefixes
4 having the same duration.

1 Claims 58-60 (canceled)

1 Claim 61 (previously presented): A communications
2 apparatus, comprising:
3 a periodic signal generator module for
4 generating a first periodic signal; and

5 a prefix generation module for generating a
6 multi-part prefix from a first periodic signal, the
7 prefix generation module including:
8 means for performing a cyclic
9 extension operation on the first periodic
10 signal to generate a cyclic prefix
11 portion;
12 means for processing the cyclic
13 prefix portion to generate a continuity
14 prefix portion from the cyclic prefix
15 portion; and
16 means for appending the cyclic
17 prefix portion to the end of the
18 continuity prefix portion.

1 Claim 62 (previously presented): A communications
2 apparatus, comprising:
3 a periodic signal generator module for
4 generating a first periodic signal; and
5 a prefix generation module including:
6 means for generating a multi-
7 part prefix from a first periodic signal
8 by performing a cyclic extension operation
9 on the first periodic signal to generate a
10 cyclic prefix portion;
11 means for processing a preceding
12 periodic signal to generate a continuity
13 prefix portion from the preceding periodic
14 signal; and

15 means for appending the cyclic
16 prefix portion to the end of the
17 continuity prefix portion.

1 Claim 63 (new): A multi-tone signal communications
2 apparatus for communicating information using N tones,
3 where N is a positive integer greater than one, the
4 apparatus comprising:
5 means for generating N analog signals, each one
6 of the N analog signals corresponding to a different one
7 of the N tones, wherein each of the N analog signals
8 includes a periodic signal representing a symbol to be
9 transmitted during said symbol transmission period;
10 means for separately generating N signal
11 prefixes, one signal prefix being generated for each one
12 of the N analog signals from the one of the N periodic
13 signals included in the corresponding one of the N analog
14 signals, each of the N signal prefixes including multiple
15 parts, said means for separately generating N signal
16 prefixes including, for each one of the N analog signals:
17 i) means for generating a first
18 cyclic prefix part from the included
19 periodic signal representing the current
20 symbol; and
21 ii) means for generating a second
22 prefix part from the included periodic
23 signal representing the preceding symbol
24 and from the first cyclic prefix part; and

25 means for transmitting the N analog signals
26 into a communications channel using M antennas, where M
27 is an integer and where $1 < M < N$.

1 Claim 64 (new): The apparatus of claim 63, wherein $M=N$.

1 Claim 65 (new): The apparatus of claim 63, further
2 comprising the step of:

3 means for separately amplifying each of the N
4 analog signals prior to transmitting said N analog
5 signals.

1 Claim 66 (new): The apparatus of claim 65, wherein each
2 of said N analog signals has a duration corresponding to
3 at least a symbol transmission period.

Claim 67 (new): A multi-tone signal communications
apparatus for communicating information using N tones,
where N is a positive integer greater than one, the
apparatus comprising:

a processor configured to:

generate N analog signals, each one of the N
analog signals corresponding to a different one of the N
tones, wherein each of the N analog signals includes a
periodic signal representing a symbol to be transmitted
during said symbol transmission period;

separately generate N signal prefixes, one
signal prefix being generated for each one of the N
analog signals from the one of the N periodic signals
included in the corresponding one of the N analog

signals, each of the N signal prefixes including multiple parts, said separately generating N signal prefixes including, for each one of the N analog signals:

generating a first cyclic prefix part from the included periodic signal representing the current symbol; and

generating a second prefix part from the included periodic signal representing the preceding symbol and from the first cyclic prefix part; and

communicate the N analog signals to a transmitter for transmission into a communications channel using M antennas, where M is an integer and where $1 < M < N$.

- 1 Claim 68 (new): A communications apparatus for
2 communicating information using N tones, where N is a
3 positive integer greater than one, the apparatus
4 comprising:
5 means for generating N analog signals, each one
6 of the N analog signals corresponding to a different one
7 of the N tones and wherein each of said N analog signals
8 has a duration corresponding to at least a symbol
9 transmission period and wherein each of the N analog
10 signals includes a periodic signal representing a symbol
11 to be transmitted during said symbol transmission period;
12 means for separately generating N signal
13 prefixes, one signal prefix being generated for each one
14 of the N analog signals from the one of the N periodic

15 signals included in the corresponding one of the N analog
16 signals;

17 means for separately amplifying each of the N
18 analog signals prior to transmitting said N analog
19 signals; and

20 means for transmitting the N analog signals
21 into a communications channel using M antennas, where M
22 is an integer and where $1 < M \leq N$,

23 wherein each of the N signal prefixes includes
24 multiple parts and wherein the means for separately
25 generating N signal prefixes includes, for each one of
26 the N analog signals:

27 means for generating a first cyclic
28 prefix part from the included periodic signal
29 representing the current symbol; and

30 means for generating a second prefix
31 part to be a periodic signal, the beginning of
32 the generated second prefix part having the
33 same phase as the end of the periodic signal
34 representing the preceding symbol and the end
35 of the generated second prefix part having the
36 same phase as the beginning of the first cyclic
37 prefix part.

1 Claim 69 (new): The apparatus of claim 68, wherein each
2 of the N periodic signals is a sinusoidal wave.

1 Claim 70 (new): The apparatus of claim 68, wherein each
2 of the N periodic signals is a square wave.

1 Claim 71 (new): A multi-tone signal communications
2 apparatus for communicating information using N tones,
3 where N is a positive integer greater than one, the
4 apparatus comprising:
5 a processor configured to:
6 generate N analog signals, each one of the N
7 analog signals corresponding to a different one of the N
8 tones and wherein each of said N analog signals has a
9 duration corresponding to at least a symbol transmission
10 period and wherein each of the N analog signals includes
11 a periodic signal representing a symbol to be transmitted
12 during said symbol transmission period;
13 separately generate N signal prefixes, one
14 signal prefix being generated for each one of the N
15 analog signals from the one of the N periodic signals
16 included in the corresponding one of the N analog
17 signals;
18 separately amplify each of the N analog signals
19 prior to transmitting said N analog signals; and
20 communicate the N analog signals to M antennas
21 for transmission into a communications channel, where M
22 is an integer and where $1 < M \leq N$,
23 wherein each of the N signal prefixes includes
24 multiple parts; and
25 wherein the processor is configured to, as part of
26 separately generating N signal prefixes:
27 generate a first cyclic prefix part
28 from the included periodic signal representing
29 the current symbol; and

30 generate a second prefix part to be a
31 periodic signal, the beginning of the generated
32 second prefix part having the same phase as the
33 end of the periodic signal representing the
34 preceding symbol and the end of the generated
35 second prefix part having the same phase as the
36 beginning of the first cyclic prefix part.

1 Claim 72 (new): A multi-tone signal communications
2 apparatus for communicating information using N tones,
3 where N is a positive integer greater than one, the
4 apparatus comprising:
5 means for generating in parallel, for each one
6 of the N tones, a separate periodic signal including at
7 least one high order harmonic signal component that is
8 different from the fundamental frequency signal component
9 of said tone, wherein the generated periodic signal
10 includes a square wave; and
11 means for transmitting the generated N periodic
12 signals into a communications channel.

1 Claim 73 (new): The apparatus of claim 72, wherein the
2 periodic signal generated for each of the N tones,
3 includes multiple high order harmonic signal components.

1 Claim 74 (new): The apparatus of claim 72, further
2 comprising:
3 means for generating, in parallel, for each one
4 of the N tones, a separate periodic signal prefix.

1 Claim 75 (new): A multi-tone signal communications
2 apparatus for communicating information using N tones,
3 where N is a positive integer greater than one, the
4 apparatus comprising:

5 a processor configured to:

6 generate in parallel, for each
7 one of the N tones, a separate periodic
8 signal including at least one high order
9 harmonic signal component that is
10 different from the fundamental frequency
11 signal component of said tone, wherein the
12 generated periodic signal includes a
13 square wave; and

14 communicate the generated N
15 periodic signals to a transmission device
16 for transmission into a communications
17 channel.

1 Claim 76 (new): A computer readable medium embodying
2 machine executable instructions for controlling a
3 communications device to implement a method of
4 communicating with another device using a multi-tone
5 signal including N tones, where N is a positive integer
6 greater than one, the method comprising:

7 generating in parallel, for each one
8 of the N tones, a separate periodic signal
9 including at least one high order harmonic
10 signal component that is different from the
11 fundamental frequency signal component of said

12 tone, wherein the generated periodic signal
13 includes a square wave; and
14 transmitting the generated N periodic
15 signals into a communications channel.

1 Claim 77 (new): A multi-tone signal communications
2 apparatus for communicating information using at least N
3 tones, where N is a positive integer greater than one,
4 the method comprising:
5 means for separately generating, for each one
6 of the N tones, a passband periodic signal representing a
7 symbol, at least some of the N generated passband
8 periodic signals include a high order harmonic signal
9 component in addition to a fundamental frequency signal
10 component, the high order harmonic signal component
11 having a frequency which is higher than the frequency of
12 the fundamental signal component; and
13 means for transmitting the N generated passband
14 periodic signals.

1 Claim 78 (new): The apparatus of claim 77, wherein the
2 passband periodic signals for each one of the N tones are
3 generated in parallel; and
4 wherein the means for transmitting the N
5 generated passband periodic signals includes different
6 antennas for broadcasting different ones of said N
7 passband periodic signals.

1 Claim 79 (new): The apparatus of claim 77, comprising:

2 means for combining at least some of the N
3 generated passband periodic signals prior to
4 transmission.

1 Claim 80 (new): A multi-tone signal communications
2 apparatus for communicating information using at least N
3 tones, where N is a positive integer greater than one,
4 the apparatus comprising:

5 a processor configured to:
6 separately generate, for each
7 one of the N tones, a passband periodic
8 signal representing a symbol, at least
9 some of the N generated passband periodic
10 signals include a high order harmonic
11 signal component in addition to a
12 fundamental frequency signal component,
13 the high order harmonic signal component
14 having a frequency which is higher than
15 the frequency of the fundamental signal
16 component; and
17 communicate the N generated
18 passband periodic signals to a
19 transmission device for transmission into
20 a communications channel.

1 Claim 81 (new): A communications apparatus comprising:
2 means for generating a multi-part prefix from a
3 first periodic signal, the means for generating a multi-
4 part prefix from the first periodic signal including:

5 i) means for performing a cyclic
6 extension operation on the first periodic
7 signal to generate a cyclic prefix
8 portion;
9 ii) means for processing the cyclic
10 prefix portion to generate a continuity
11 prefix portion from the cyclic prefix
12 portion; and
13 iii) means for appending the cyclic
14 prefix portion to the end of the
15 continuity prefix portion; and
16 means for communicating a signal including the
17 generated multi-part prefix to a transmitter.

1 Claim 82 (new): A communications apparatus comprising:
2 a processor configured to:
3 generate a multi-part prefix from a first
4 periodic signal by:
5 performing a cyclic extension operation on
6 the first periodic signal to generate a
7 cyclic prefix portion;
8 processing the cyclic prefix portion to
9 generate a continuity prefix portion from
10 the cyclic prefix portion; and
11 appending the cyclic prefix portion to the
12 end of the continuity prefix portion; and
13 communicate a signal including the generated
14 multi-part prefix to a transmitter.

1 Claim 83 (new): A communications apparatus, comprising:
2 means for generating a multi-part
3 prefix from a first periodic signal, the step
4 of generating a multi-part prefix from the
5 first periodic signal including:
6 means for performing a cyclic
7 extension operation on the first periodic
8 signal to generate a cyclic prefix portion;
9 means for processing a preceding
10 periodic signal to generate a continuity prefix
11 portion from the preceding periodic signal; and
12 means for appending the cyclic prefix
13 portion to the end of the continuity prefix
14 portion; and
15 means for communicating a signal including the
16 generated multi-part prefix to a transmitter.

1 Claim 84 (new): A communications apparatus, comprising:
2 a processor configured to:
3 generate a multi-part prefix from a
4 first periodic signal, generating a multi-part
5 prefix from the first periodic signal
6 including:
7 performing a cyclic
8 extension operation on the first
9 periodic signal to generate a cyclic
10 prefix portion;
11 processing a preceding
12 periodic signal to generate a

13 continuity prefix portion from the
14 preceding periodic signal; and
15 appending the cyclic prefix
16 portion to the end of the continuity
17 prefix portion; and
18 communicate a signal including the generated
19 multi-part prefix to a transmitter.

1 Claim 85 (currently amended): A communications device,
2 comprising:
3 means for generating a multi-part prefix from a
4 first periodic signal, the means for generating a multi-
5 part prefix from the first periodic signal including:
6 means for performing a cyclic
7 extension operation on the first periodic
8 signal to generate a cyclic prefix portion;
9 means for processing the cyclic
10 prefix portion and a preceding periodic signal
11 to generate a continuity prefix portion from
12 both the cyclic prefix portion and the
13 preceding periodic signal; and
14 means for appending the cyclic prefix
15 portion to the end of the continuity prefix
16 portion; and
17 means for communicating a signal including the
18 generated multi-part prefix to a transmitter.

1 Claim 86 (new): The apparatus of claim 85, wherein said
2 means for processing of the cyclic prefix portion and a
3 preceding periodic signal includes:

4 means for performing a cyclic extension
5 operation on the cyclic prefix portion to generate a
6 first cyclic extension;
7 means for performing another cyclic extension
8 operation on the preceding periodic signal to generate a
9 second cyclic extension, the first and second cyclic
10 extensions corresponding to a signal time period which is
11 the same for both the first and second cyclic extensions;
12 and
13 means for combining the first and second cyclic
14 extensions corresponding to said signal time period to
15 generate said continuity prefix portion, the means for
16 combining the first and second cyclic extensions
17 including:
18 means for windowing the combined cyclic
19 extensions using an attenuating window.

1 Claim 87 (new): The apparatus of claim 86, wherein each
2 of said means for performing cyclic extension operations
3 includes means for copying a portion of the signal upon
4 which said cyclic extension operation is performed.

1 Claim 88 (currently amended): A communications device,
2 comprising:
3 a processor configured to:
4 generate a multi-part prefix from a first
5 periodic signal, generating a multi-part prefix from the
6 first periodic signal including:

7 performing a cyclic extension
8 operation on the first periodic signal to
9 generate a cyclic prefix portion;
10 processing the cyclic prefix
11 portion and a preceding periodic signal to
12 generate a continuity prefix portion from
13 both the cyclic prefix portion and the
14 preceding periodic signal; and
15 appending the cyclic prefix
16 portion to the end of the continuity
17 prefix portion; and
18 communicate a signal including the generated
19 multi-part prefix to a transmitter..

1 Claim 89 (new): A communications device, comprising:
2 means for generating a multi-part prefix from a
3 first periodic signal, the means for generating a multi-
4 part prefix from the first periodic signal including:
5 means for performing a cyclic
6 extension operation on the first periodic
7 signal to generate a cyclic prefix portion;
8 means for generating a continuity
9 prefix portion;
10 means for appending the cyclic prefix
11 portion to the end of the continuity prefix
12 portion; and
13 wherein the continuity prefix portion has a
14 frequency which is different from the frequency of the
15 first periodic signal but has a phase at the point where

16 the cyclic prefix portion is appended to the continuity
17 prefix portion that is the same as the phase of the
18 beginning of the cyclic prefix portion; and
19 means for communicating a signal including the
20 generated multi-part prefix to a second device.

1 Claim 90 (new): A communications device, comprising:
2 a processor configured to:
3 generate a multi-part prefix from a first
4 periodic signal, generating a multi-part prefix from the
5 first periodic signal including:
6 performing a cyclic extension
7 operation on the first periodic signal to
8 generate a cyclic prefix portion;
9 generating a continuity prefix
10 portion;
11 appending the cyclic prefix
12 portion to the end of the continuity
13 prefix portion; and
14 communicate a signal including the generated multi-
15 part prefix to a second device; and
16 wherein the continuity prefix portion has a
17 frequency which is different from the frequency of the
18 first periodic signal but has a phase at the point where
19 the cyclic prefix portion is appended to the continuity
20 prefix portion that is the same as the phase of the
21 beginning of the cyclic prefix portion.

1 Claim 91 (new): A communications device, comprising:

1 means for generating a multi-part prefix from a
2 first periodic signal, the means for generating a multi-
3 part prefix from the first periodic signal including:
4 means for performing a cyclic
5 extension operation on the first periodic
6 signal to generate a cyclic prefix portion;
7 means for generating a continuity
8 prefix portion;
9 means for appending the cyclic prefix
10 portion to the end of the continuity prefix
11 portion; and
12 wherein the continuity prefix portion has a
13 phase at the beginning of the continuity prefix portion
14 that is the same as the phase of the end of a preceding
15 periodic signal; and
16 means for communicating a signal including the
17 generated multi-part prefix to a second device.

1 Claim 92 (new): An apparatus for sequentially
2 transmitting symbols in a multi-tone signal communication
3 system using N tones per symbol period, wherein the N
4 tones remain the same for multiple symbol periods, the
5 time period in which the N tones remain the same being a
6 dwell, the apparatus comprising:
7 means for rotating a constellation of
8 symbols from which consecutive symbols are
9 transmitted using one of said N tones by a
10 fixed amount and which is a function of the
11 duration of a multi-part prefix to be

12 transmitted and with the selected symbol,
13 wherein said fixed amount by which the
14 constellation of symbols is rotated is a
15 function of the tone frequency used;
16 means for selecting a symbol to be
17 transmitted from a constellation of symbols to
18 be transmitted using a signal corresponding to
19 one of said N tones; and
20 means for transmitting N signals
21 corresponding to each one of the N tones of the
22 multi-tone signal, each one of the N signals
23 being transmitted on a corresponding one of a
24 first plurality of antennas, the antenna being
25 used to transmit signals corresponding to a
26 particular tone during the dwell remaining the
27 same throughout the dwell.

1 Claim 93 (original): The apparatus of claim 92, further
2 comprising
3 means for transmitting N signals corresponding
4 to each one of the N tones of the multi-tone signal, each
5 one of the N signals being transmitted on a corresponding
6 one of a second plurality of antennas, the antenna being
7 used to transmit signals corresponding to a particular
8 tone during a second dwell remaining the same throughout
9 second dwell, the second plurality of antennas including
10 at least one antenna which is different from the antennas
11 included the first plurality of antennas.

1 Claim 94 (new): An apparatus for sequentially
2 transmitting symbols in a multi-tone signal communication
3 system using N tones per symbol period, wherein the N
4 tones remain the same for multiple symbol periods, the
5 time period in which the N tones remain the same being a
6 dwell, the apparatus comprising:

7 a processor configured to:

8 rotate a constellation of symbols from
9 which consecutive symbols are transmitted using
10 one of said N tones by a fixed amount and which
11 is a function of the duration of a multi-part
12 prefix to be transmitted and with the selected
13 symbol, wherein said fixed amount by which the
14 constellation of symbols is rotated is a
15 function of the tone frequency used;

16 select a symbol to be transmitted from a
17 constellation of symbols to be transmitted
18 using a signal corresponding to one of said N
19 tones; and

20 communicate N signals corresponding to
21 each one of the N tones of the multi-tone
22 signal to a corresponding one of a first
23 plurality of antennas, respectively, the
24 antenna being used to transmit signals
25 corresponding to a particular tone during the
26 dwell remaining the same throughout the dwell.

1 Claim 95 (new): A system for generating and transmitting
2 signals corresponding to an N tone multi-tone signal,

3 where N is a positive integer greater than 1, the system
4 comprising:

5 N periodic signal generator modules for
6 generating periodic signals, each periodic signal
7 corresponding to a different tone one of the N tones of
8 the multi-tone signal, wherein each of the N periodic
9 signal generator circuits includes a square wave
10 generator, each one of said N periodic signals including
11 a square wave having a frequency component corresponding
12 to one of said N tones of the multi-tone signal; and
13 N prefix generator modules for independently
14 generating periodic signal prefixes, each one of the N
15 prefix generator modules being coupled to a different
16 corresponding one of the N periodic generator modules.

1 Claim 96 (new): The system of claim 95, further
2 comprising:

3 N filter modules for independently filtering
4 the N periodic signals including prefixes generated by
5 the N prefix generator modules, each one of the N filters
6 being coupled to a different corresponding one of the N
7 prefix generator modules.